

# High-Density FRC Formation Studies on FRX-L\*

## Abstract

FRX-L (Field Reversed configuration eXperiment - Liner) is a magnetized-target injector for magnetized-target fusion (MTF) experiments. It was designed with the goal of producing high-density  $n \sim 10^{17} \text{ cm}^{-3}$  field reversed configurations (FRCs) and translating them into an aluminum liner (1-mm thick, 10-cm diameter cylindrical shell) for further compression to fusion conditions. Although operation at these high densities leads to shorter FRC lifetimes, our application requires that the plasma live only long enough to be translated and compressed, or on the order of 10-20  $\mu\text{s}$ . Careful study of FRC formation in situ will be done in the present experiment to differentiate between effects introduced in future experiments by translation, trapping, and compression of the FRC. We present current results on the optimization of the FRC formation process on FRX-L and compare the results with those from past experiments.

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## Conclusions

- FRCs are ideally suited as targets for MTF, a method by which a magnetized plasma of  $T \sim 300$  eV and  $n \sim 10^{17} \text{ cm}^{-3}$  is imploded to fusion conditions
- This is a density regime much higher than that of current FRC experiments and could yield interesting results.
- Improvement in the main bank crowbar is still needed
  - Causes elongation of separatrix, which disrupts reconnection process
- But even so... the addition of cusp coils has greatly improved FRC formation!
  - Achieved lifetime  $\sim 10\text{-}12 \mu\text{s}$
  - Excluded flux  $\sim 1\text{-}2 \text{ mWb}$